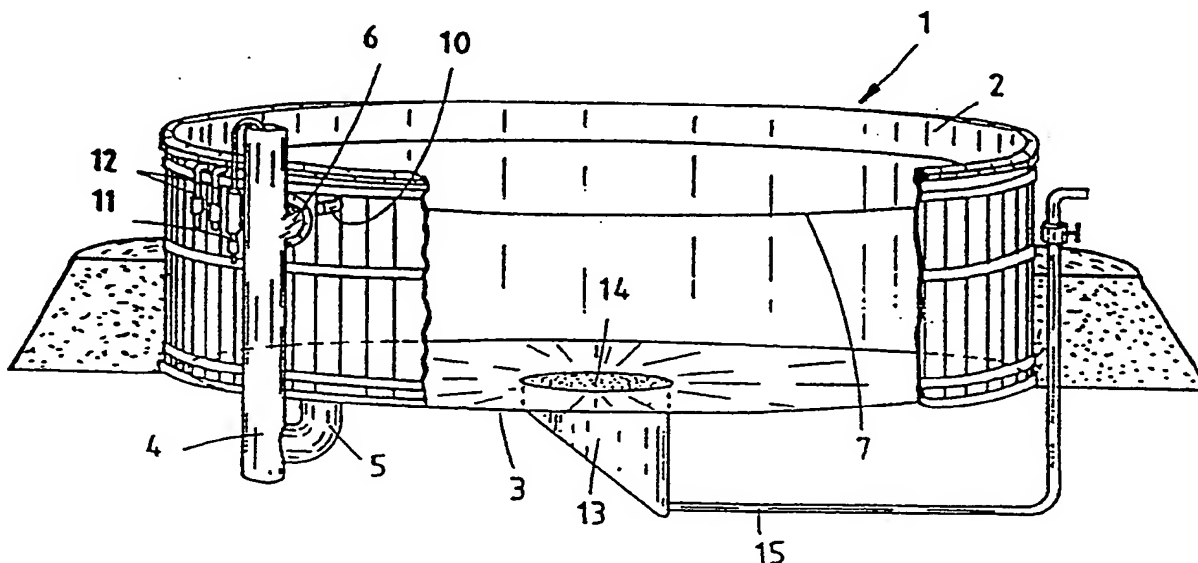


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> : <b>A01K 61/00</b>	<b>A1</b>	(11) International Publication Number: <b>WO 90/03729</b> (43) International Publication Date: <b>19 April 1990 (19.04.90)</b>
<p>(21) International Application Number: <b>PCT/NO89/00107</b></p> <p>(22) International Filing Date: <b>9 October 1989 (09.10.89)</b></p> <p>(30) Priority data: <b>884542</b> <b>12 October 1988 (12.10.88)</b> <b>NO</b></p> <p>(71)(72) Applicants and Inventors: <b>VADSETH, Arne [NO/NO]; Vardeveien 26, N-3470 Slemmestad (NO). VADSETH, Ragnar [NO/NO]; Gartnerveien 43, N-3478 Nærsnes (NO).</b></p> <p>(74) Agent: <b>JØRGENSEN, Tor; Bryns Patentkontor A/S, P.O. Box 9566, Egertorget, N-0128 Oslo 1 (NO).</b></p> <p>(81) Designated States: <b>AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, FI, FR (European patent), GA (OAPI patent), GB, GB (European patent),</b></p>		<p><b>HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.</b></p> <p><b>Published</b> <i>With international search report.</i></p>

(54) Title: A BREEDING FACILITY FOR MARINE ANIMALS, PARTICULARLY FISH



## (57) Abstract

A breeding facility (fish farm) for marine animals, particularly fish, comprising a tank (1) with a preferably circular cross-section, designed to be filled with water to a certain level (7). The fish farm comprises the following combination: a) that it is connected to a circulation pump (4) of the air lift type with an inlet (5) near the bottom of the tank (1) and an outlet (6) near the surface (7) of the water in the tank (1), b) that it is connected to a supply pipe or pipes (12) for fresh water and a discharge pipe (10) to provide for a renewal of the water in the tank over time, c) that the inlet (5) from the pump is directed tangentially or approximately tangentially within the tank to provide a constant, circulating current in the water, d) that in the bottom there is provided a well (13) centrally located in the tank for collection of excrements and feed remains and other impurities, and e) that to the well (13) is connected a suction pipe for the removal of impurities.

***FOR THE PURPOSES OF INFORMATION ONLY***

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Mali
BB	Barbados	FR	France	MR	Mauritania
BE	Belgium	GA	Gabon	MW	Malawi
BF	Burkina Fasso	GB	United Kingdom	NL	Netherlands
BG	Bulgaria	HU	Hungary	NO	Norway
BJ	Benin	IT	Italy	RO	Romania
BR	Brazil	JP	Japan	SD	Sudan
CA	Canada	KP	Democratic People's Republic of Korea	SE	Sweden
CF	Central African Republic	KR	Republic of Korea	SN	Senegal
CG	Congo	LI	Liechtenstein	SU	Soviet Union
CH	Switzerland	LK	Sri Lanka	TD	Chad
CM	Cameroon	LU	Luxembourg	TG	Togo
DE	Germany, Federal Republic of	MC	Monaco	US	United States of America
DK	Denmark				

# A BREEDING FACILITY FOR MARINE ANIMALS, PARTICULARLY FISH.

The present invention relates to a breeding facility for marine animals, particularly fish, comprising a tank with a preferably circular cross-section designed to be filled with water up to a certain level. The facility may be land-based or may consist of a sealed tank or bag that is submerged in water.

The majority of breeding facilities for consumer fish found today are so-called fish farm ponds, enclosures which are placed in the sea. These pond enclosures consist of a net bag, and water is renewed with the aid of the natural current in the water. There are consequently some strict limitations with regard to placement of such fish farms since, first of all, there must be sufficiently strong current -- without its being too strong, there must not be too much sea, and it must not be too shallow or too confined. Fish farms of this type put a very heavy strain on the sea environment. The fish farms pollute to quite a high degree because of excrements from the fish and feed remains that float out into the surrounding water through the walls of the net bag. Fish in captivity are readily susceptible to various diseases and parasites, and large quantities of medicaments are therefore used in connection with the fish farming industry. These medicaments are often administered in the feed, and will spread into the surrounding water where the medicaments are consumed by wild fish, sea fowl and animals -- for example, otters -- that hunt the fish in the ponds or outside these enclosures. It is quite conceivable that resistant groups of bacteria could arise, which could result in irreparable damage to the environment and which might also be transmitted to humans. The fish in the open ponds are moreover vulnerable to contagion from wild fish, and to parasites. Heavy alga growth, high incidence of jellyfish and the like can cause catastrophic death rate of fish in the farming ponds.

The purpose of the present invention is primarily to eliminate

the above mentioned disadvantages and to optimize fish farming with regard to both land-based systems and water based facilities. This is achieved according to the invention by a fish farm facility of the type mentioned introductorily, which is characterized by the combination of the following features:

- a) that it is connected to a circulation pump with an inlet near the bottom of the tank and an outlet near the surface of the water in the tank,
- b) that it is connected to a supply pipe or pipes for fresh water and a discharge pipe to provide for a renewal of the water over time,
- c) that the inlet from the pump is directed tangentially or approximately at a tangent within the tank to provide a constant, circulating current in the water,
- d) that in the bottom there is provided a well for collection of excrements and feed remains and other impurities, and
- e) that to the well is connected a suction pipe for the removal of the impurities.

Additional features and advantages will be disclosed in the dependent claims.

Several advantages are achieved by means of the facility in accordance with the invention. First, one gains control of the environment, both in the fish farm itself and -- in the case of a water-based system -- in the surrounding milieu. The constant whirlpool in the container or tank will collect solid particles centrally at the bottom and will trap them in the well, from which the impurities can be transported out through the suction pipe.

By circulating the water through an air lift pump one can achieve purification of the water. The air lift pump, of course, functions by blowing in large quantities of air that rise up through

a vertical pipe as bubbles. The fish take in oxygen from the water by means of their gills and discharge  $\text{CO}_2$  together with urinary products, particularly in the form of ammonia. When water containing  $\text{CO}_2$  and ammonia is sucked into the air lift pump, the  $\text{CO}_2$  gas will be taken up by the rising air bubbles. The same thing will happen to some extent with regard to ammonia and other substances. The most important thing, however, is that the water is ridded of  $\text{CO}_2$ . This air that flows in at the surface of the tank is air-enriched so that one constantly obtains a new supply of oxygen-enriched water. The water in the fish farm is thus circulated the entire time and is freed of  $\text{CO}_2$  and enriched with air. Smaller amounts of new water are being supplied the whole time, essentially in order to hold the ammonia content in the water at an acceptable level. Because there are used only small amounts of fresh water, it would be expedient to maintain a higher temperature in the system, at least in certain periods of the year. In this connection a heat pump can be used, inasmuch as the heat in the discharged water and/or the heat in the surrounding water can be utilized, in the case of a water-based system.

The fish farm in accordance with the invention would in addition be very suitable as a land-based facility, which is quite advantageous from the point of view of several other conditions. The objections to a land-based system have been that pumping of flowing water from a nearby water source has been very demanding in terms of energy. With the system according to the invention, the water circulates through the air lift pump without requiring any energy to lift the water, and fresh water is added in only small amounts, which thus requires little energy. The system is totally controlled with regard to any strain on the outside environment, and also with regard to the influence of the outside environment on the fish within the facility.

Where a sea-based system is concerned, the small amount of water

that is necessary in order to replenish the water in the tank could be taken from remote places; if, for example, the surface water is polluted or too cold or too warm, the water can be taken from deeper lying layers. Due to the fact that we are talking about small amounts of water, the pumping costs would be relatively modest.

The system has been the object of particular interest in areas where warm ground water is found. In a fish farm according to the invention, located in an area where there is access to warm ground water, consumer fish of very valuable types that have a high price on the market can be farmed. Here one thinks primarily of sturgeon, which brings 2 to 3 times as high a price as salmon on an international market. The sturgeon requires a water temperature of about 25°C, and this can very easily be obtained with the aid of warm ground water in Southern European countries where there is rich access to warm ground water at a relatively modest depth below the ground level.

In accordance with a further development of the invention, carp pools may be attached to the system. The pipe from the well that is placed at the bottom leads to the carp pool, and the same pertains to water from the outlet from the tank. These pipes will carry large quantities of nutrients to the water in the carp pools. The carp in a carp pool are not given feed, but live exclusively on the vegetation that grows in the carp pool. In order to achieve sufficient growth, large quantities of nutrients must be added. In accordance with the invention these nutrients can be supplied at no cost from the fish farm.

The invention will now be explained more fully in the following, with reference to the drawing that schematically shows an embodiment form for a fish farm according to the invention.

Figure 1 shows the fish farm seen in perspective with some of the wall cut away, and

Figure 2 shows the fish farm seen from directly above.

The fish farm according to the invention consists of a tank 1 with a circular wall 2 and a bottom 3. To the tank 1 is connected an air lift pump 4 with an intake 5 at the bottom of the tank 1. The outlet 6 from the air lift pump passes through the wall of the tank in the proximity of the surface 7 of the water fill in the tank. The inlet pipe 8 is directed tangentially within the tank so that a whirlpool current is formed in the water in the tank, as shown with arrows 9. The water level in the tank is regulated by an overflow pipe 10. Air to the air lift pump is supplied through an air conduit 11 and water supply for renewal of the water in the tank is brought in through the pipes 12.

In the bottom of the tank is provided a well 13 having a filter 14. To the well 13 is connected a suction pipe 15.

By means of the air lift pump, continuous circulation of the water in the tank 1 is obtained. At the same time, the water is oxygenated by means of the air bubbles in the air lift pump, and the water is cleaned by virtue of the  $\text{CO}_2$  in the water being taken up in the air bubbles floating up and passing out into the open air. Through the supply pipes the water is renewed over time. The water that is added may be heated to maintain a constant temperature in the water in the tank. The polluted water that runs out from the tank through the overflow pipe 10 can go either to carp pools or to a purifying plant. The pipe 15 that sucks out solid impurities from the well 13 can go to the build-up of fertilizer or to carp pools for their fertilization. The whirling current collects pollutants, such as feed remains and

excrements from the fish, centrally in the tank, and these will descend and be gathered into the well 13.

As will be understood, one would be able to obtain full control with a fish farming facility according to the invention. There is used a sealed tank or bag, so that no contaminants are brought into the surrounding environment. Excrements and feed remains that descend into the well are pumped to a plant that takes care of these substances as fertilizers. The overflow water, which is only very slightly polluted, can be conducted to a conventional purifying plant for waste water. As regards those periods when the fish have been given medication, the tank can be drained completely after the medicating and replenished with fresh water. The water that is contaminated by medicines can be purified in a special facility.



P a t e n t   C l a i m s

1.

A breeding facility (fish farm) for marine animals, particularly fish, comprising a tank (1) with a preferably circular cross-section designed to be filled with water up to a certain level (7), characterized by a combination of the following features:

- a) that it is connected to a circulation pump (4) with an inlet (5) near the bottom of the tank (1) and an outlet (6) near the surface (7) of the water in the tank (1),
- b) that it is connected to a supply pipe or pipes (12) for fresh water and a discharge pipe (10) to provide a renewal of the water in the tank over time,
- c) that the inlet (6) from the pump is directed tangentially or approximately at a tangent within the tank to provide a constant, circulating current in the water,
- d) that in the bottom there is provided a well (13) centrally located in the tank for collection of excrements and feed remains and other impurities, and
- e) that to the well (13) is connected a suction pipe for the removal of impurities.

2.

A fish farm according to claim 1, characterized in that the circulation pump (4) is of the air lift type.

3.

A fish farm according to claim 1, characterized in that the discharge pipe (10) from the tank (1) and the suction pipe (15) from the well (13) lead to one or more carp pools or the like which are located near the tank (1).

4.

A fish farm according to claim 1 or 2, where the tank is located on land, characterized in that the water supply consists entirely or partially of warm ground water.



# INTERNATIONAL SEARCH REPORT

International Application No PCT/NO 89/00107

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: A 01 K 61/00																													
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched <sup>7</sup></div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black;">Classification System</td> <td style="width: 50%; border-bottom: 1px solid black;">Classification Symbols</td> </tr> <tr> <td style="height: 40px; vertical-align: top; border: 1px solid black;">IPC5</td> <td style="height: 40px; vertical-align: top; border: 1px solid black;">A 01 K</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched <sup>8</sup></div> <p style="margin-top: 10px;">SE,DK,FI,NO classes as above</p>			Classification System	Classification Symbols	IPC5	A 01 K																							
Classification System	Classification Symbols																												
IPC5	A 01 K																												
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category <sup>9</sup></th> <th style="width: 60%;">Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup></th> <th style="width: 30%;">Relevant to Claim No. <sup>13</sup></th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;">GB, A, 2200822 (RAGNAR VADSETH) 17 August 1988, see the whole document</td> <td style="text-align: center; vertical-align: top;">1-2,4</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="text-align: center; vertical-align: top;">--</td> <td style="text-align: center; vertical-align: top;">3</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;">FR, A1, 2601555 (FAUCOUP ROGER) 22 January 1988, see the whole document</td> <td style="text-align: center; vertical-align: top;">1-2,4</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="text-align: center; vertical-align: top;">--</td> <td style="text-align: center; vertical-align: top;">3</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;">NORSK FISKEOPPDRETT, Vol. 3, 1987 Kåre Tvinnereim: "Strømningsforhold i oppdrettskar for settefisk ", see page 42 - page 43</td> <td style="text-align: center; vertical-align: top;">1-2,4</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="text-align: center; vertical-align: top;">--</td> <td style="text-align: center; vertical-align: top;">3</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;">NO, B, 160753 (ROALD WILLIS KNUITSEN) 20 February 1989, see the whole document</td> <td style="text-align: center; vertical-align: top;">1-2,4</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="text-align: center; vertical-align: top;">--</td> <td style="text-align: center; vertical-align: top;">3</td> </tr> </tbody> </table>			Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>	X	GB, A, 2200822 (RAGNAR VADSETH) 17 August 1988, see the whole document	1-2,4	Y	--	3	X	FR, A1, 2601555 (FAUCOUP ROGER) 22 January 1988, see the whole document	1-2,4	Y	--	3	X	NORSK FISKEOPPDRETT, Vol. 3, 1987 Kåre Tvinnereim: "Strømningsforhold i oppdrettskar for settefisk ", see page 42 - page 43	1-2,4	Y	--	3	X	NO, B, 160753 (ROALD WILLIS KNUITSEN) 20 February 1989, see the whole document	1-2,4	Y	--	3
Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>																											
X	GB, A, 2200822 (RAGNAR VADSETH) 17 August 1988, see the whole document	1-2,4																											
Y	--	3																											
X	FR, A1, 2601555 (FAUCOUP ROGER) 22 January 1988, see the whole document	1-2,4																											
Y	--	3																											
X	NORSK FISKEOPPDRETT, Vol. 3, 1987 Kåre Tvinnereim: "Strømningsforhold i oppdrettskar for settefisk ", see page 42 - page 43	1-2,4																											
Y	--	3																											
X	NO, B, 160753 (ROALD WILLIS KNUITSEN) 20 February 1989, see the whole document	1-2,4																											
Y	--	3																											
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>10</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Δ" document member of the same patent family</p> </div> </div>																													
<b>IV. CERTIFICATION</b> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black;">Date of the Actual Completion of the International Search 12th January 1990</td> <td style="width: 50%; border-bottom: 1px solid black;">Date of Mailing of this International Search Report 1990 -01- 17</td> </tr> <tr> <td style="border-bottom: 1px solid black;">International Searching Authority <div style="text-align: center;">SWEDISH PATENT OFFICE</div></td> <td style="border-bottom: 1px solid black;">Signature of Authorized Officer <i>Kerstin Boije Janson</i> Kerstin Boije Janson</td> </tr> </table>			Date of the Actual Completion of the International Search 12th January 1990	Date of Mailing of this International Search Report 1990 -01- 17	International Searching Authority <div style="text-align: center;">SWEDISH PATENT OFFICE</div>	Signature of Authorized Officer <i>Kerstin Boije Janson</i> Kerstin Boije Janson																							
Date of the Actual Completion of the International Search 12th January 1990	Date of Mailing of this International Search Report 1990 -01- 17																												
International Searching Authority <div style="text-align: center;">SWEDISH PATENT OFFICE</div>	Signature of Authorized Officer <i>Kerstin Boije Janson</i> Kerstin Boije Janson																												

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
Y	SU, , 789082 (MOSCOW LOMONOSOV UNIV) 26 March 1979, see the whole document -----	3

ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. PCT/NO 89/00107

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2200822	17/08/88	NONE	
FR-A1- 2601555	22/01/88	NONE	
NO-B- 160753	20/02/89	NONE	
SU- - 789082	26/03/79	NONE	